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(12) UK Patent Application (19) GB (11) 2 213 438 (13) A

(43) Date of A publication 16.08.1989

(21) Application No 8828738.8

(22) Date of filing 08.12.1988

(30) Priority data
(31) 8726670 (32) 08.12.1987 (33) GB

(51) INT CL⁴
B62M 1/04

(52) UK CL (Edition J)
B7E EDL

(56) Documents cited
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EP 0067035 A1 US 3877725 A US 3623748 A

(58) Field of search
UK CL (Edition J) B7E EDL EDR EDX
INT CL⁴ B62M 1/00 1/02 1/04 1/06 1/08 1/10 1/12 1/14 1/16 1/18 1/20

(71) Applicant
Myron Medical Products Limited

(Incorporated in the United Kingdom)

Chester House, Windsor End, Beaconsfield, Bucks, HP9 2JJ, United Kingdom

(72) Inventor
Ronald William John Slee

(74) Agent and/or Address for Service
Forrester Ketley & Co
Forrester House, 52 Bounds Green Road, London, N11 2EY, United Kingdom

(54) A propulsion device

(57) A device for manually propelling a wheelchair comprises a drive arm (6) mounted on a wheelchair adjacent a wheel (1) of the chair so as to be manually pivotable by the occupant of the chair about a pivot axis parallel to the axis of rotation of the wheel and a driving block (11) carried by the drive arm (6). The driving block (11) is pivotally mounted on the drive arm and is selectively engageable with the wheel (1), so that pivoting of the drive arm (6), with the driving block (11) engaged with the wheel (1), rotates the wheel (1) and propels the wheelchair.

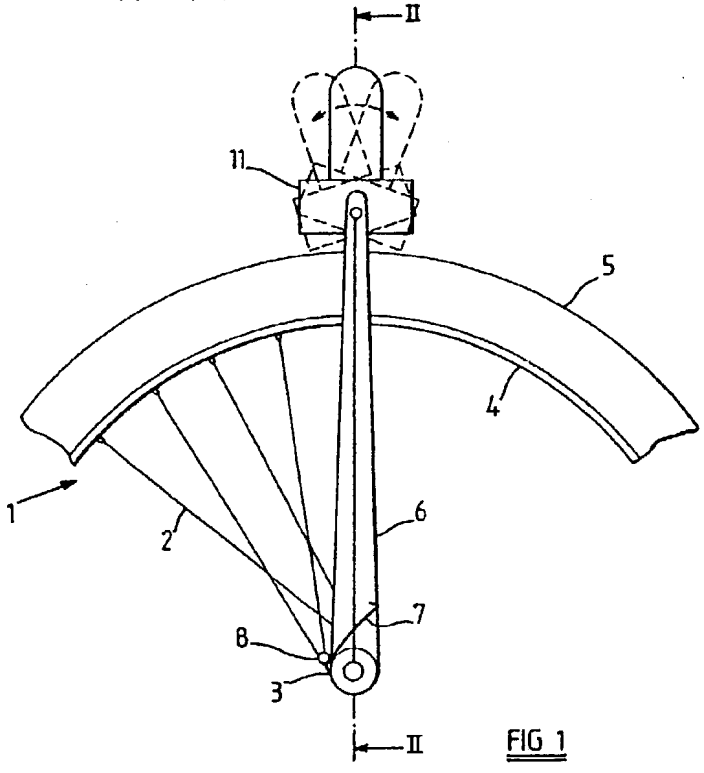

FIG 1

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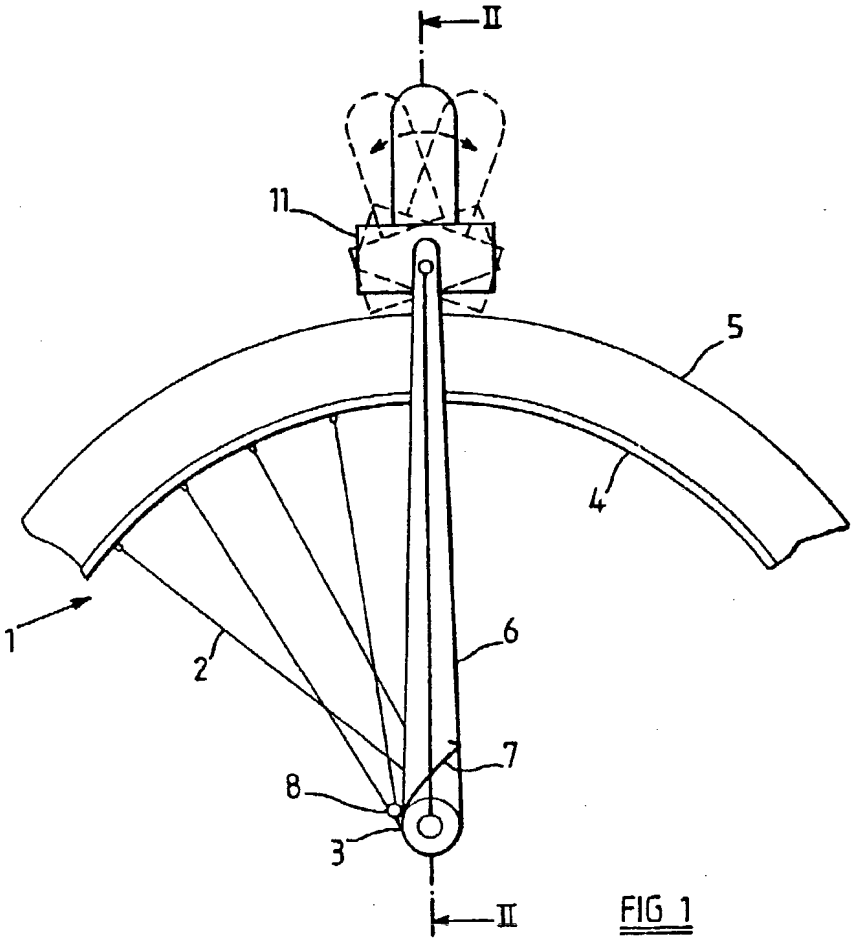

FIG 1

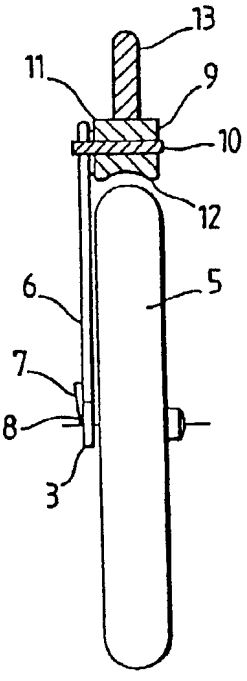

FIG 2

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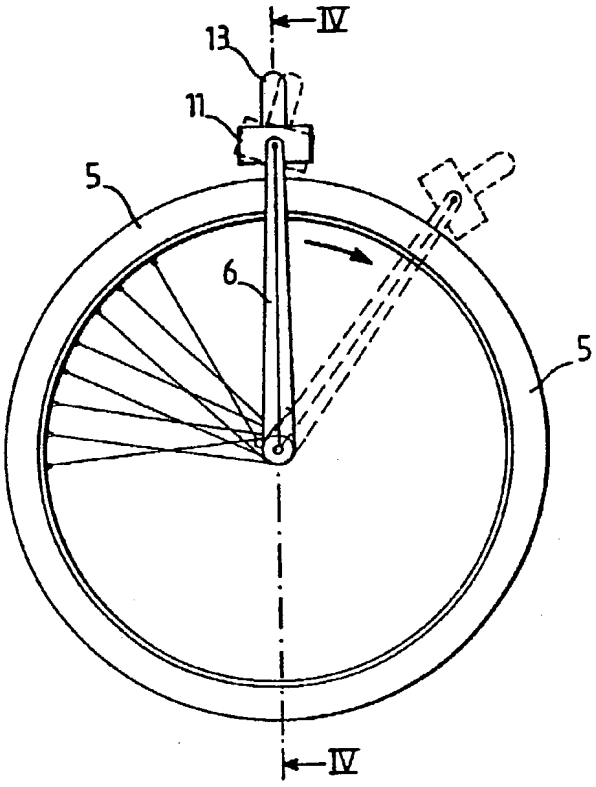

FIG 3

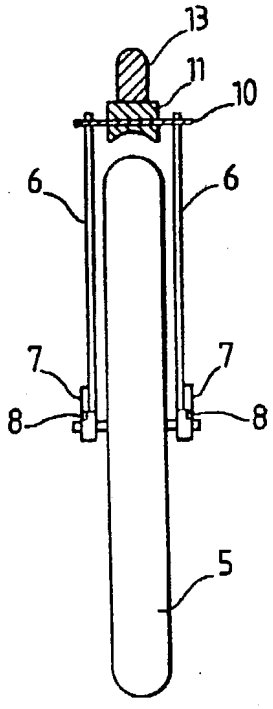

FIG 4

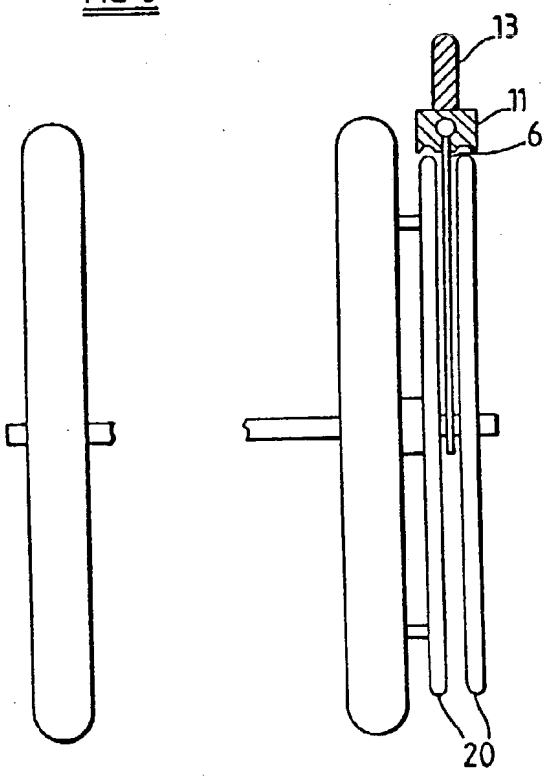

FIG 5

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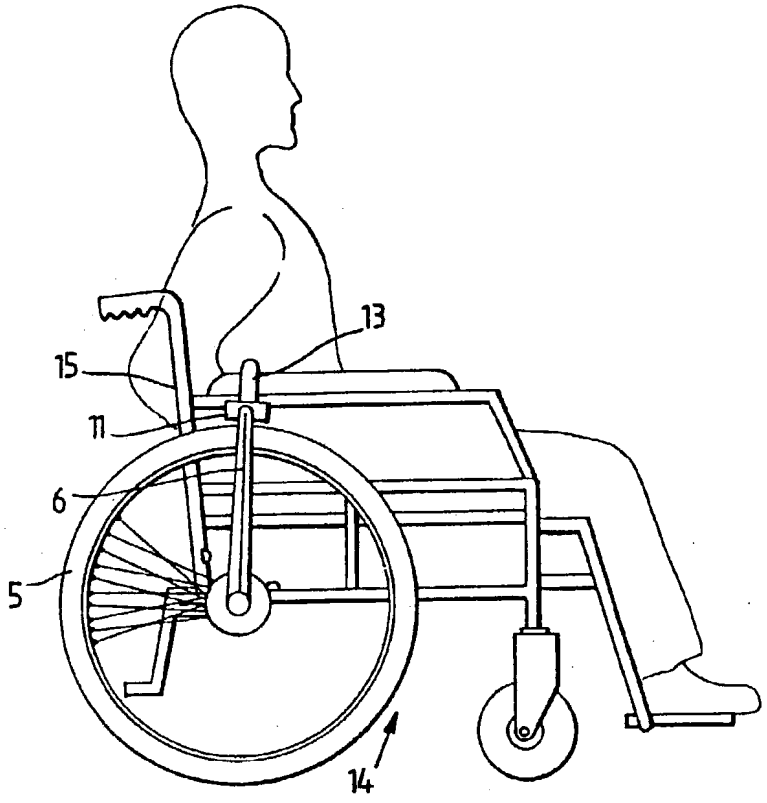

FIG 6

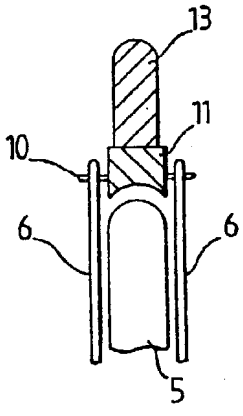

FIG 7a

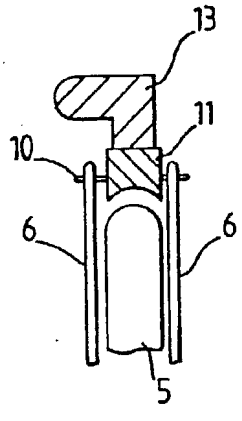

FIG 7b

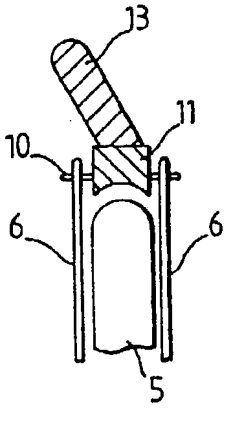

FIG 7c

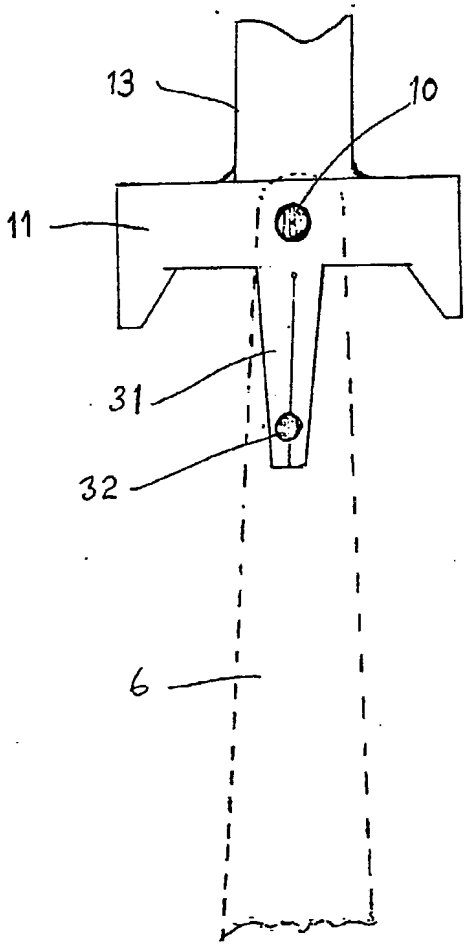

FIG 8a

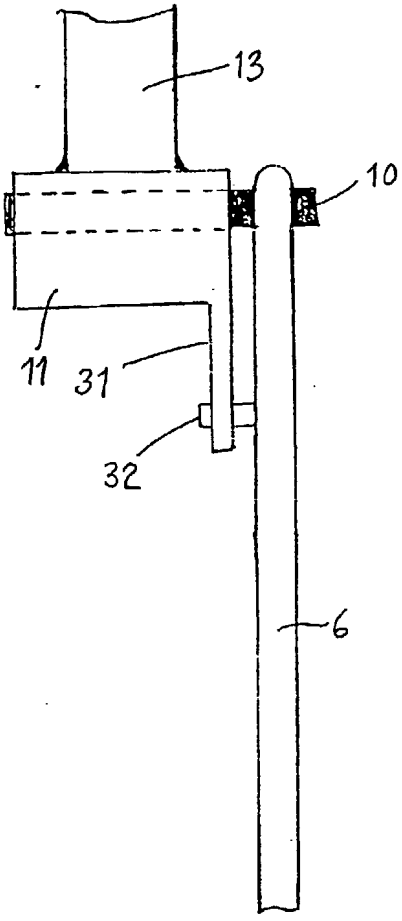

FIG 8b

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Patents Act 1977
P4854GB/ALM/mkf

Description of Invention

"A Propulsion Device"

THIS INVENTION relates to a propulsion device and, more particularly, to a propulsion device for a self-propelled wheelchair in which the motive power is supplied by the occupant of the wheelchair.

A conventional, manual wheelchair is propelled by either directly turning a wheel of the wheelchair or by turning a rim provided on a wheel on each side of the wheelchair. The occupant of the wheelchair must repeatedly grip and push or pull the wheel or rim at an awkward angle. The repeated gripping by the fingers in this way can be painful or difficult especially for the aged, sick or otherwise disadvantaged persons likely to be the main users of such means of transport. The angles at which the force must be applied in order to propel the wheelchair also places considerable strain on the users shoulders and trunk and causes extreme difficulty to those with diminished muscle function or reduced strength and mobility.

There is also a risk of damage to the fingers or knuckles of a wheelchair occupant as sometimes the fingers may become trapped between the wheel-spokes of the wheelchair. In addition, the fingers, hands, knuckles and arms are at risk of painful blows when negotiating doorways or passing other fixed objects.

It is moreover generally inconvenient if the wheelchair is being propelled along wet or muddy ground for the occupant of the wheelchair to have to directly

grip and push a wheel of the wheelchair. In this case a rim provided on the wheel may also become wet thus making self-propulsion of the wheelchair very difficult for the occupant.

There is furthermore a general difficulty experienced by wheelchair users in arresting the motion of a wheelchair by gripping the wheel or rim provided with sufficient force. This would be very difficult in conditions similar to those mentioned above. In view of this, it is usually necessary to provide a separate braking mechanism which can often prove difficult for the occupant of a wheelchair to activate alone.

It is an object of the present invention to provide a device for propelling a wheelchair which overcomes or at least mitigates the disadvantages mentioned above.

Accordingly, the present invention provides a device for manually propelling a wheelchair, in which a drive arm is mounted on the chair adjacent a wheel of the chair so as to be manually pivotable by an occupant of the chair about a pivot axis parallel to the axis of rotation of the wheel, and force-transmitting means in the form of a block is pivotally mounted on the drive arm and is selectively engageable with the wheel, so that pivoting of the drive arm with the force-transmitting means in its engaged position rotates the wheel and propels the wheelchair.

In order that the invention may be more readily understood, embodiments thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a side view of a propulsion device embodying the present invention;

Figure 2 is a sectional view on the line II-II of Figure 1;

Figure 3 illustrates another embodiment of a device according to the present invention;

Figure 4 is a sectional view on the line IV-IV of Figure 3;

Figure 5 shows a further embodiment of a device according to the present invention;

Figure 6 shows the position of the device in use mounted on a wheelchair;

Figures 7a to 7c illustrate several suggested forms of handle for the device; and

Figures 8a and 8b are respectively a fragmentary side view and a fragmentary end view illustrating resilient restoring means for biasing a driving block of the device into a neutral position.

Referring now to Figures 1 and 2 of the accompanying drawings, a conventional, manual wheelchair (not shown) comprises a pair of rear wheels 1 (only one of which is shown) having of a diameter chosen to suit the occupant of the wheelchair. The wheel is mounted on a rear axle of the wheelchair in a conventional manner. A plurality of spokes 2 extend between a hub of the wheel 3 and the outer periphery of the wheel 4. A tyre 5 is provided around the outer periphery of the wheel.

Positioned adjacent the hub of the wheel 1, for example provided on the rear axle, is a pivot which carries thereon an elongate arm 6 which extends upwards from the pivot towards the outer periphery of the wheel 4. The width of the arm tapers slightly from the end adjacent the hub 3 to the outer end remote therefrom, which outer end extends beyond an upper surface of the tyre 5.

A spring member 7 provided in close proximity to the hub of the rear axle biases the arm 6 into a rest position. The spring member 7 may be chosen from a variety of spring components. In this embodiment, a leaf spring is connected between the hub of the axle and the arm 6 in order to bias the arm 6 into an upright rest position.

A limit stop 8 is provided in the form of a projecting member adjacent the anchorage for the spring member 7 (in this embodiment) to locate the arm 6 in the upright rest position.

The end of the arm 6 which extends beyond the surface of the tyre 5 is provided with a cross-bore 9 which extends therethrough and is dimensioned to releasably receive a retaining pin 10 to mount such pin parallel to the wheel axle.

A driving block 11 is rockably mounted on the pin 10 and has a substantially rectangular configuration, the underside 12 of which has a shallow, arcuate configuration which substantially corresponds to the curve of the outer edge of the tyre 5. The driving block 11 is provided with a projecting operating handle 13 which may be constructed in any number of forms (see Figures 7a, 7b and 7c) in order to suit the particular occupant of the wheelchair. The driving block 11 and handle 13 may be separately or integrally formed, for example injection moulded, extruded, forged, fabricated or machined.

The driving block 11 is provided with a bore located through the centre thereof, of similar dimensions to the bore 9 provided in the arm 6. The driving block 11 is mounted adjacent the end of the arm 6 and retained in position by passing the retaining pin 10 through the

respective bores in the arm 6 and the block 11. The pin 10 may be provided with a locking means to prevent accidental removal thereof while the device is in use. In the rest position, when the driving block 11 is horizontal, the underside 12 of the block is spaced from the outer edge of the tyre 5.

In operation, for forward rotation of the wheel, as shown by the arrow in Figure 3, the operating handle 13 is pushed forward, so causing the driving block 11 to pivot forwards about the retaining pin 10 until a leading edge of the block 11 contacts the tyre 5 provided on the wheel. Sustained pressure on the handle 13 will cause the block 11 to exert a force against the tyre 5 of the wheel so that, as the block 11 is pushed forwardly, it applies a motive force to the tyre 5 to rotate the wheel and, as the wheel rotates, the block and the arm 6 travel around the pivot. At the end of the operating stroke, the tangential path of the block 11 moves out of contact with the arc of the wheel and the arm 6 is returned via the spring member 7 to the upright rest position. The limit stop 8 ensures that the arm 6 is returned to the desired upright rest position. The operating stroke is then repeated and continuous rotation of the wheel and subsequently forward motion of the wheelchair is achieved.

If the wheel is required to rotate in the opposite direction to that shown in Figure 3, then the operating stroke begins by the occupant of the wheelchair gently pushing the operating handle 13 and the arm 6 about the pivot without engaging the tyre 5, then pulling lightly on the handle 13 of the driving block 11 to pivot the block 11 backwards about the pin 10 until a trailing edge of the block contacts the tyre 5. The handle 13 of the block is then pulled back, so that the block 11 exerts a force onto the tyre 5 and causes the said tyre to rotate

in a rearward direction. At the end of the operating stroke, the arm 6 again returns to the upright rest position under the force of the spring member 7 and is precluded from travelling further around the pivot in a rearward direction by the limit stop 8.

Thus, it can be seen that the wheel~~chair~~ can be made to rotate in either direction without the necessity for the occupant of the wheelchair to grip a rim or tyre of a wheel and so requiring only minimum strength. Also, the back of the occupant is firmly supported by the chair and so the angle at which the force is applied to propel the wheelchair is more suited to the occupant of the chair than a conventional wheelchair.

When it is desired to arrest the motion of a wheelchair, the wheel of which is rotating as indicated by the arrow in Figure 3, the occupant of the wheelchair need only pivot the driving block 11 backwards about the retaining pin 10 in order that the trailing edge of the block 11 contacts the tyre 5 of the wheel. The occupant would then continue to pull on the handle 13 of the block thus applying a force to the wheel in the direction opposite to the direction of rotation thereof. Thus, the block 11 will arrest the forward rotation of the wheel and cause the wheelchair to come to rest.

Figures 3 and 4 of the drawings illustrate an embodiment of the present invention wherein two arms 6 are provided on the wheel, one on either side of said wheel. Each arm 6 is provided with a spring member 7 and limit stop 8 and operates as above.

Figure 5 of the drawings illustrates an embodiment of the present invention wherein twin rims, wheels 20 or tyres are provided on one side of the wheelchair. By a lateral movement of the handle 13 of the driving block

11, the motive force applied via the handle 13 can be selectively applied to either or both of the twin wheels as required. Thus, if the force is applied to both wheels 20, the wheelchair will be propelled in either a forward or rearward direction as explained above. However, should a force be applied to either one of the wheels, the wheelchair will be caused to turn either left or right depending upon the wheel to which the force is applied. This enables a wheelchair user having only a single arm or one usable arm to propel themselves in a chosen direction.

Figure 6 of the drawings shows the position of the device in use by an occupant of a wheelchair 14. The occupant's back is firmly positioned against the back 15 of the wheelchair and the operating stroke of the device is effected without placing undue strain on the shoulders and trunk of the occupant.

With a propulsion device of the type disclosed in the present invention, the hands of the wheelchair occupant are not in any danger of being injured by the spokes of the wheels or by obstacles such as door frames. From this, it can be seen that the overall width of the wheelchair can be reduced as there is no need to provide propelling rims on the rear wheels. This will enable wheelchair users to use and visit existing facilites which do not have to be specially redesigned.

The arm 6 of the device can be produced in different lengths to fit all existing sizes of rear wheels and the device can be quickly and easily fitted to existing wheelchairs as well as being a feature of newly designed chairs.

It is also envisaged that the pivot for the arm 6 could be located at a position other than adjacent a hub

3 of the wheel in order that the device is most comfortable for each specific occupant.

A further arrangement (not shown) which could be used to locate the arm 6 at a preferred position is a system of two off-set springs 7 connected between the wheel hub 3 and the arm 6. At the completion of the operating stroke, one spring will have been expanded and the other compressed and, as the springs return to the equilibrium position of the system the arm 6 will be swiftly returned to the preferred position without the need for a limit stop member.

The driving block 11 of a device embodying the invention is desirably provided with restoring means normally biasing the block into a neutral position in which the block is disengaged from the wheel.

Whilst any suitable restoring means may be used for this purpose, Figures 8a and 8b illustrate, by way of example, one advantageous form which the restoring means may take.

The restoring means illustrated in Figures 8a and 8b comprises a resilient finger 31 which is formed integrally with the block 11 and projects downwardly from the block alongside the drive arm 6 to which the finger is fixedly connected adjacent its lower end by an anchor pin 32. The block 11 and finger 31 are integrally moulded from a suitable plastic material, such as an acrylic based material. In use of a device equipped with such a restoring means, the finger 31 is flexed upon pivoting of the block about the pin 10 by the handle 13 and, upon release of the handle, serves to bias the block back into the central neutral position shown in Figure 8a.

CLAIMS:

1. A device for manually propelling a wheelchair, in which a drive arm is mounted on the chair adjacent a wheel of the chair so as to be manually pivotable by an occupant of the chair about a pivot axis parallel to the axis of rotation of the wheel, and force-transmitting means in the form of a block is pivotally mounted on the drive arm and is selectively engageable with the wheel so that pivoting of the drive arm with the force-transmitting means in its engaged position rotates the wheel and propels the wheelchair.

2. A device according to claim 1, further comprising means for locating the drive arm in a rest position.

3. A device according to claim 2, wherein the locating means comprises a return spring acting on the drive arm to bias it against a limit member defining the rest position.

4. A device according to any one of the preceding claims, wherein the width of the drive arm tapers from the pivot to the force-transmitting means.

5. A device according to any one of the preceding claims, in which the pivot axis of the drive arm is the same as the axis of rotation of the wheel.

6. A device according to any preceding claim in which the block has an arcuate recess defined in an underside thereof.

7. A device according to any preceding claim, in which an operating handle is mounted on the block.

8. A device according to any preceding claim, in which two drive arms are mounted on the chair.

9. A device according to any preceding claim, in which restoring means are provided for normally biasing the block into a position in which the block is disengaged from the wheel.

10. A device according to claim 9, in which the restoring means comprises a resilient member fixedly connected to the block and to the drive arm.

11. A device according to claim 10, in which the resilient member is a resilient finger formed integrally with the block and fixedly attached to the drive arm at an anchor point on the arm.

12. A wheelchair in combination with a device according to any one of the preceding claims.

13. A device for propelling a wheelchair substantially as hereinbefore described with reference to and as shown in the accompanying Figures.

14. Any novel feature or combination of features described herein.

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